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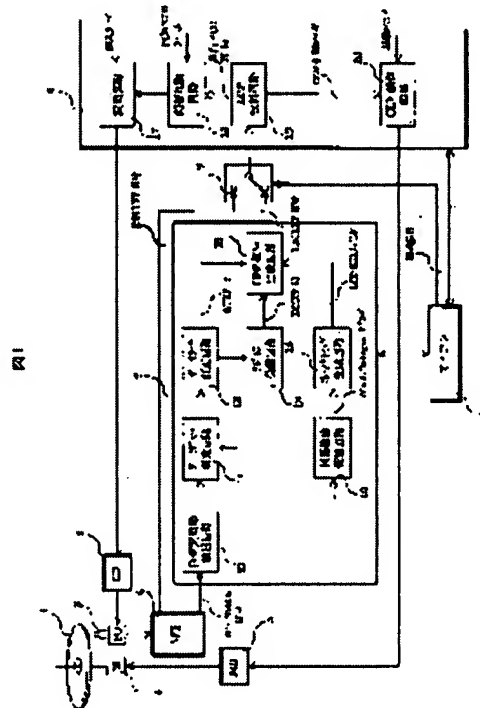
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## (54) DATA TRANSFERRING METHOD AND OPTICAL DISK RECORDING DEVICE

(57)Abstract:

**PROBLEM TO BE SOLVED:** To enable the recording control with respect to an optical disk having a wobble phase modulation format and the rotational control of the optical disk to be performed by an optical disk recording device corresponding to an LPP (land pre-pit) format.

**SOLUTION:** In this data transferring method, when address information and additional information whose phases are modulated on the optical disk are detected and a plurality of a series of address information which are detected at the time of performing the data transfer of data including these detected information are converted into address information with respect to data blocks being recording units on the optical disk and the data of information including these converted results are transferred to reproduced wobble signals from the optical disk having the wobble phase modulation format, the transferring of the data is performed in a period when wobbles corresponding to a next data block are reproduced and the data are transferred by being made to be synchronized with the detection timing of a synchronizing signal whose phase is modulated and which is included in the period.



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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the data transfer approach which is needed in case informational postscript and rewriting are performed especially to an optical disk record medium, and an optical disk recording apparatus about the data transfer approach and an optical disk recording apparatus.

[0002]

[Description of the Prior Art] DVD (Digital Versatile Disc) was mentioned as a mass optical disk record medium, and DVD-R of a postscript mold, DVD-RW of a rewriting mold, DVD+RW, and DVD-RAM were developed in recent years as a record medium which can record informational. Even if it is in the condition of not recording, address information, additional information, and a synchronizing signal are recorded on these optical disks in order to pinpoint the record location on an optical disk (truck).

[0003] As the modulation approach of the above-mentioned address information and additional information is shown in JP,2001-110061,A, a run DOPURI pit (LPP is called hereafter) format and a wobble phase modulation (PM is called below Wobble Phase Modulation) format are mentioned, a LPP format is adopted as DVD-R and DVD-RW, and PM format is adopted as DVD+RW. PM format and a LPP format are explained here using drawing 2 and drawing 3.

[0004] Drawing 2 shows an example of PM format and drawing 2 (a) shows the physical relationship of the wobble phase-modulation approach, the data frame recorded as a train of a record mark on a synchronizing signal, modulation data, and a recording track, and a wobble. Drawing 2 (b) consists of modulation data, shows the ADIP (address in pre-groove) WORD which is the configuration unit of the information data modulated by the wobble by the wobble phase modulation, and shows the relation of the ADIP numbers of words contained in the ECC block which is the data-logging unit of ADIP WORD and DVD further. Drawing 2 (c) has shown the physical relationship of rewriting in an ECC block unit, the approach of a postscript, an ECC block head, termination, and a wobble.

[0005] In drawing 2 (a), a wobble phase-modulation part is a part which the phase contrast of wobbles produces, is appearance spacing of the phase-modulation section, and the WORD sink which hits the head of ADIP WORD, and the bit sink which hits the head of each data bit are distinguished, and it discriminates zero data and one data from a bit sink as a data bit by the difference in appearance spacing to the following phase-modulation section. The appearance period of a WORD sink or a bit sink is made into the number of wobbles, are 93 wobbles, and is 32T (a channel bit,  $T = 26.16\text{MHz}$  whose  $T$  is the base unit of the record mark length on an optical disk) per one wobble. The relation between 93 wobbles and data frames is two ( $1488T \times 2$ ) per 93 wobbles, and is physical relationship to which the synchronizing signal (starting point of Frame sync) of the 17th wobble location (namely, starting point of Wobble 16) and a data frame head corresponds from the wobble to WORD and a bit sink head.

[0006] In drawing 2 (b), ADIP WORD consists of 6.5 bytes and the wobble phase modulation of the data for 52 bits is carried out to the wobble signal included in 104 frames (they are 4 sectors at 26 1 sectors). The internal configuration of ADIP WORD consists of a data bit 0 (= 0 immobilization)

equivalent to a top WORD sink, and the ADIP address (3 bytes of data 0 and data 1-23), AUX (auxiliary) data (1 byte of data 24-31), the ADIP address and the error correcting code (2.5 bytes of data 32-51) that corrects the error contained in AUX data. Since it is 108 (four sectors) per ADIP WORD, four ADIP WORD and address information were contained in a part for 1ECC block (16 sectors) which is a record unit to an optical disk, and the access dependability to the record object location has been secured.

[0007] It is the object which performs rewriting in an ECC block unit, or a postscript in drawing 2 (c), and the dummy data of 8 T parts is added before the ECC block for the purpose of record, from termination 8T of a before ECC block, record of dummy data is started and bond record of ECC blocks is performed. In the case of record termination, the data of ECC block termination 8 T parts are not recorded on an optical disk. The bond field of ECC blocks will be equivalent to 8T of ECC block termination, and is pressing down the error propagation within the ECC block by gap of a record location to min at the time of generation of a redundant field, and playback. The recording start field of dummy data, an ECC block termination environment, and the physical relationship of a wobble are prescribed to be settled in the wobble 16th before [ head ] a data frame.

[0008] Drawing 3 shows an example of a LPP format and drawing 3 (a) shows the configuration of the physical relationship of a wobble, arrangement of LPP on the physical relationship of LPP, and the land truck with which LPP is minced, and the data frame on the groove truck which is a recording track, and the LPP data which are one of the data units modulated as LPP. Drawing 3 (b) shows an example of the modulation rule of the synchronizing signal pattern modulated as LPP, and a data pattern. Drawing 3 (c) consists of two or more LPP data, and shows a data configuration besides address information.

[0009] In drawing 3 (a), LPP is minced as a slot by the land truck contiguous to the groove truck which generates a record mark, per [ one wobble (186T) / LPP / one ] is assigned, and a synchronizing signal and data are modulated by the location of PURIPITTO which exists in the wobble which continues three. Furthermore, the synchronizing signal of the wobble location where LPP is minced, and the data frame head recorded on a groove truck corresponds. 13 bits in which LPP data contain a LPP synchronizing signal per 26 frames 1 sector are modulated, and LPP data are modulated by the even-numbered frame and the odd-numbered frame at a duplex. LPP data contain 8 bits of data bits which are components, such as address information. Drawing 3 (b) shows the modulation approach of the synchronizing signal by LPP, zero data, and one data. Drawing 3 (c) is shown about the configuration of the address information by LPP etc. In [ of 8 bits of data bits contained in 16 LPP data which 1ECC block length deserves in a LPP format ] a total of 16 bytes, 3 bytes of ECC address, With the value included in 1 byte of field ID which identifies the parity A which is a 3-byte correction sign to it, and the content of data for continuing 6 bytes, and Field ID 3 bytes of the same ECC address of a value as the previous ECC address, AUX data, etc. consist of parity B which is a total of 6 bytes and a 3-byte correction sign to it.

[0010] In case it records to an optical disk, an optical disk recording apparatus detects address information and AUX data. Furthermore, it seeks from address information to an informational recording start location, and record control to an optical disk is performed. Measurement, drawing in to the target rotational frequency, and CLV (constant linear velocity: constant linear velocity) control are simultaneously performed for a current optical disk rotational frequency from the detection timing of a synchronizing signal. Therefore, synchronization with the generation and the wobble of a record mark in the recording track on an optical disk is attained, and rewriting of recording information and postscript record are attained. However, as explained in the top, in order to record to PM format optical disk, the recording apparatus corresponding to PM format was required [ since the record formats of address information differ, in order to record to a LPP format optical disk the recording apparatus corresponding to a LPP format was required, and ] of the LPP format optical disk and PM format optical disk.

[0011]

[Problem(s) to be Solved by the Invention] The optical disk recording device in recent years serves as an important element with which implementation of the drive corresponding to the multi-optical disk which performs record and playback to the postscript mold of various classes, such as CD-R and CD-RW, and

an erasable optical disk including DVD determines the added value. The specialized circuit which constitutes the interior of a recording apparatus and bears signal processing to each optical disk builds in the logical circuit for performing signal processing according to a format of these optical disks. Therefore, naturally it cannot respond to signal processing to the optical disk which is not assumed at the time of a circuit design. The method of preparing two or more specialized circuits corresponding to each format as an approach of improving this, or the approach of adopting the specialized circuit corresponding to two or more formats can be considered. However, at the former, since circuit magnitude becomes large, it is disadvantageous in respect of cost, and by the latter, redevelopment of a logical circuit is needed and it becomes very disadvantageous in respect of the difficulty of development of the early drive corresponding to a multi-optical disk, and cost.

[0012] Then, performing signal processing to the optical disk which newly corresponds, the conversion circuit changed into the signal according to signal processing in the existing logical circuit is developed, and it is possible to constitute the recording device whose record control and CLV roll control to an optical disk become possible. Therefore, the conversion approach of the signal which makes record control and a CLV roll control possible, and the transfer approach are required, and it is a technical problem. Therefore, the object of this invention is to offer the data transfer approach which cancels the above-mentioned technical problem, and an optical disk recording device.

[0013]

[Means for Solving the Problem] The above-mentioned technical problem receives a playback wobble signal from the optical disk in PM format. The address information on the optical disk by which the phase modulation is carried out, and additional information are detected. From a series of address information detected when transmitting data including the detection information In case data transfer of the information which changes into the address information to the data block which is a record unit on an optical disk, and includes the conversion result is carried out It is solvable by transmitting in the period which reproduces the wobble equivalent to the following data block, and transmitting, synchronizing to the detection timing of the synchronizing signal by which is contained and the phase modulation is carried out to the period.

[0014] Moreover, the optical disk recording device which performs record control per data block while performing a roll control A detection means to detect the address information and addition data on the 1st synchronizing signal and an optical disk from the wobble phase-modulation section of PM format optical disk, A means to judge the data block address from a series of address information plurality, A means to generate the data and the 2nd synchronizing signal which applied to the LPP format correspondingly to the transfer data containing a block address, and to generate the 1st transfer signal in the next data block period, The 2nd transfer signal obtained by the run DOPURI pit playback on an optical disk, The selection means which carries out the selection output of the 1st transfer signal, the block address contained in the transfer signal after selection, and a means to detect the 2nd synchronizing signal, Establishing a means to pinpoint the target truck location and to control generation of a modulating signal and an output from a detection block address, and the control means which controls optical disk rotational speed from the appearance period of the 2nd synchronizing signal can also be solved.

[0015]

[Embodiment of the Invention] Drawing 1 is the data transfer approach of this invention, and drawing showing the 1st example about an optical disk recording device. The inside of drawing, the optical head with which one can record the optical disk in PM format, and 2 on an optical disk, The laser driver which controls the semiconductor laser with which 3 is contained in an optical head, The spindle motor with which 4 drives an optical disk 1, Motor Driver by which 5 controls revolution actuation of a spindle motor 4, While 6 reproduces the wobble signal over the truck on an optical disk 1 from the signal detected from the photodetector of an optical head AFE which reproduces LPP as detection and a LPP signal when an optical disk is a LPP format (Analog Front End), 7 performs signal processing to the optical disk in PM format, and the LPP signal over the detection information on the ADIP WORD obtained by signal processing is generated. While performing the record control and modulating-signal

generation to the truck on an optical disk 1 from the LPP conversion circuit to output and the address information from which 8 is obtained by signal processing to a LPP signal. The optical disk control circuit which measures optical disk rotational speed from the detection timing of the synchronizing signal modulated by the LPP signal, and performs a roll control. The microcomputer with which 9 controls the whole recording apparatus, and 16 are the selectors 16 which perform selection of the detection LPP signal from AFE6, or a generation LPP signal according to distinction of the optical disk 1 with a microcomputer 9.

[0016] Said LPP conversion circuit 7 contains the component explained below. From the detection result of a phase modulation section detector and a phase modulation part which detects a wobble phase modulation part, a WORD sink, Detect each synchronizing signal of a bit sink and the appearance period of each detected synchronizing signal is measured. From the synchronous detection protection network 10 which avoids incorrect detection by the protection aperture, and bit sink detection, by detection of the following phase-modulation part Zero data, The data bit judging circuit 11 and data bit which judge one data are latched. Constitute ADIP WORD from the order of detection, and the continuity over the ADIP address is verified from the data latch correction circuit 12 which performs error correction processing, and the ADIP WORD after correction. The address protection network 13, WORD sink which determine the address to an ECC block, LPP transfer data are generated from the AUX data latched to the ECC address and the data latch correction circuit 12 which were determined from the detection timing of each bit sink in the frame timing generation circuit 14 which generates a LPP transfer timing, and the address protection network 13. It consists of LPP signal generation circuits 15 which generate the LPP signal which attained synchronization with a LPP transfer timing.

[0017] Said optical disk control circuit 8 contains the component explained below. As opposed to the ECC data which are record data to an optical disk 1 8 / 16 modulation processing, Coincidence with the modulation circuit 17 which generates a record signal by adding a synchronizing signal, the ECC address detected from the LPP signal, and the recording start ECC address set up from a microcomputer 9, Generation initiation of a modulating signal [ as opposed to a modulation circuit 17 by the record halt control with a microcomputer 9 ], Detection of the synchronizing signal modulated by the record control circuit 18 which controls termination, and the received LPP signal, It consists of the ECC address, a LPP detector 19 which detects AUX data, and roll control timing generated from the detection of a synchronizing signal by which the LPP signal modulation was carried out from the roll control circuit 20 which generates the roll control signal over Motor Driver 5.

[0018] Drawing 4 shows an example of the conversion approach to the LPP transfer data to detection of the ADIP WORD in the optical disk recording apparatus of drawing 1 , and the record control approach of an ECC block for an optical disk 1, and explains the outline of the record actuation in an optical disk recording apparatus. In drawing 4 , ADIP WORD consists of 3 bytes per word of the ADIP address, and 1 byte of AUX data, as shown in drawing 2 (b). The ADIP address value of 00c000 to 00c00f (hexadecimal display) over a series of ADIP WORD W (N) detected by the LPP conversion circuit 7 in drawing 4 - W (N+f), AUX data a (N) - a (N+f) are shown. In the optical disk control circuit 8, since the record unit to an optical disk 1 is performed per ECC block, it determines the 1ECC address from the four continuous ADIP addresses per 1ECC block.

[0019] A response with the ADIP address and an ECC start address serves as a value which carried out the 2-bit right shift (it is a division at 4) of the ADIP address value, and the ECC addresses serve as a continuation value. Furthermore, to the ECC block corresponding to the truck location which detected the ADIP address, from the relation transmitted as a LPP signal, the determined ECC address takes the value carried out +one, for example, and it is included in the LPP signal over the following ECC block, and it transmits it in the truck section to the following ECC block. The above processing is performed in the address protection network 13. Moreover, since 4 bytes per 1ECC block are contained about AUX data, to the ECC block which detected 4 bytes of AUX data, it includes in the LPP signal over the following ECC block, and transmits. The ECC address and 4 bytes of AUX data which were determined meet the format of the LPP format in drawing 3 , and are changed and transmitted to the pulse train of LPP. It not only adopts the address value carried out +one to the value determined from two or more

ADIP addresses, but generation of the explained ECC address does not perform amendment by the value carried out -one or +1, and -1, and it does not care about it as a value as it is.

[0020] Next, it is carried out in the optical disk control circuit 8, and record control of the ECC block data from detection of the information included in the transmitted LPP signal to the recording track on an optical disk is explained. In drawing 4, the detection result of the information which LPP decoding is performed in the LPP detector 19, and is included in the transmitted LPP signal is shown, and after detecting the LPP signal of the last of the ECC block section, an ECC address value and 4 bytes of AUX data are detected. The record control circuit 18 detects coincidence with the detected ECC address value and the recording start ECC address set up from a microcomputer 9, and when in agreement, it generates a record control signal to a modulation circuit 17. From last 8T of dummy ECC data, a record control signal controls the modulation processing to the ECC data 0, and generation of a record signal, and controls them to end generation of a record signal by termination 8T of the ECC data 1 which end record. A modulation circuit generates a record signal, performing modulation processing to the ECC data inputted according to a record control signal. A record pulse becomes irregular, and a record signal is formed as a record mark on the recording track on an optical disk 1, taking the synchronization with the data frame from the head of dummy data, and a wobble location.

[0021] Drawing 5 shows the transfer timing of the LPP signal for being carried out in the optical disk recording apparatus of drawing 1, and performing the roll control to an optical disk 1. In drawing 5, a phase-modulation part is detected from a playback wobble signal, and a WORD sink and a bit sink are detected in the synchronous detection protection network 10 from the detection period. The wobble counter contained in the frame timing generation circuit 14 is 93 dividing counter which measures the appearance period of a WORD sink or a bit sink, and synchronizes a counter according to the detection timing of a WORD sink and each bit sink. About the synchronization approach, the detection timing of a WORD sink is after [ from a top phase-modulation part ] 5 wobbles, and a wobble counter is loaded to "5." The detection timing of a bit sink is after [ from a top phase-modulation part ] 1 wobble, and a wobble counter is loaded to "1." Next, a LPP transfer timing is generated from decoding of a wobble counter value to which synchronization was performed from the WORD sink and the bit sink.

[0022] PM format of drawing 2 -- setting -- the head of a data frame -- the 17th wobble location -- synchronizing -- \*\*\*\* -- a LPP transfer timing -- the -- a wobble location synchronization is carried out and it is generated. In the LPP signal generation circuit 15, the LPP transfer data containing the determined ECC address and 4 bytes of AUX data are generated as a LPP signal synchronizing with a LPP transfer timing. Since a WORD sink and a bit sink are generated once in two frames, a LPP transfer timing becomes 1 time per two frames. In an example of drawing 5, the LPP transfer timing to WORD sink detection is synchronized in the case of a LPP synchronizing signal transfer of an even number sequence, and the LPP transfer timing to bit sink detection shows signs that it synchronizes in the case of the LPP data transfer of an even number sequence.

[0023] Therefore, a LPP transfer timing and the LPP signal generated become possible [ fluctuation of the detection timing of a WORD sink and a bit sink being reflected, and being reflected in the transfer timing of the LPP signal which generates fluctuation of an optical disk rotational frequency ].

[0024] Even when a WORD sink and a bit sink have not been detected, since a wobble counter is a dividing counter, generation and a synchronization transfer of a LPP signal are performed in a LPP transfer timing with the timing forecast which performed counter synchronization by front detection.

[0025] Drawing 6 shows the detection processing of ADIP WORD and the generation processing of LPP data to the wobble phase modulation in the LPP conversion circuit 7, the LPP detection processing performed in the optical disk controller circuit 8, and generation of control timing. In drawing 6, in order to generate LPP transfer data once about 1ECC block, they perform generation processing of the LPP data per [ to ADIP WORD ] four detection processings once. From the detection value of the ADIP address, and the value after the continuity protection, starting of LPP data generation processing specifies whether it is the ADIP WORD which corresponds to which location under 1ECC block, after specification of the ADIP WORD of ECC last, determines the ECC address and 4 bytes of AUX data, and transmits a configuration and a LPP signal for LPP data.



[0026] While performing detection of the ECC address included in it from the LPP signal transmitted in the optical disk controller circuit 8, and AUX data, roll control timing is generated. The timing synchronized per 1 sector (26 frames) as an example of roll control timing in drawing 6 is shown. This example performs by the timing synchronization by detection of the LPP synchronizing signal of the even number location located in 1 sector head. In the roll control circuit 20, as for roll control timing, an optical disk roll control is performed by the phase comparison of the pulse appearance period and criteria timing with generation and the target number of revolutions in a control signal.

[0027] Even if it has not detected a LPP synchronizing signal, interpolation close [ of the timing signal ] is carried out from the prediction location from front detection, lack of a timing signal is prevented and the stable roll control is performed.

[0028] Drawing 7 is the data transfer approach of this invention, and drawing showing the 2nd example about an optical disk recording device. When an optical disk 1 is a LPP format from the inside of drawing, and the signal with which six are detected from the photodetector of an optical head, When LPP is reproduced as detection and a LPP signal and an optical disk 1 is PM format, AFE which reproduces PM signal from the wobble detection to the truck on a disk (Analog Front End), 24 performs signal processing to the optical disk in a LPP format, and PM signal over the LPP data obtained is generated. While performing the record control and modulating-signal generation to the truck on an optical disk 1 from PM conversion circuit to output and the address information from which 8 is obtained from signal processing to PM signal Optical disk rotational speed is measured from the detection timing of the synchronizing signal modulated by PM signal. The optical disk control circuit which performs a roll control, and 16 follow distinction of the optical disk 1 with a microcomputer 9. The detection PM signal from AFE 6 Or the selectors 16 and 22 which choose a generation PM signal are detection of the synchronizing signal to transmitted PM signal, the ADIP address, and a PM detector that performs detection of AUX data, and explanation is omitted by attaching the same sign as drawing 1 about others.

[0029] Said PM conversion circuit 24 contains the component explained below. The synchronizing signal LPP sink (even number, odd frame) modulated by the playback LPP signal is detected. The synchronous detection protection network 10 which avoids incorrect detection for the appearance period of each detected synchronizing signal by measurement and the protection aperture, the data bit judging circuit 11 which performs the judgment of data 0 and data 1 to the LPP signal after a LPP sink, and a data bit are latched. Constitute LPP data from the order of a latch, and the continuity of the ECC address value acquired from the data latch correction circuit 12 which performs error correction processing, and the LPP data after correction is verified. From the detection timing of the address protection network 13 and a LPP sink which determines the ADIP address PM transfer data are generated from the AUX data latched to the ADIP address and the data latch correction circuit 12 which were determined in the frame timing generation circuit 14 which generates PM transfer timing, and the address protection network 13. It consists of PM signal generation circuits 15 which output PM signal, synchronizing by PM transfer timing.

[0030] Drawing 8 shows an example of the conversion approach from detection LPP data to PM transfer data performed in the optical disk recording apparatus of drawing 7 , and the record control approach of an ECC block for an optical disk 1, and explains the outline of the record actuation in an optical disk recording apparatus. In drawing 8 , LPP data consist of 3 bytes of the ECC address, 6 bytes of AUX data, and parity A and B drawing 3 (c) So that it may be shown. The ECC address values 00300-00303 over a series of LPP data D (N) detected by the PM conversion circuit 24 in drawing 8 - D (N+3), AUX data a (N) - a (N+23) are shown. In the optical disk control circuit 8, the record unit to an optical disk 1 is performed per ECC block, and the PM detector 22 performs detection of each synchronizing signal detection of the WORD sink to PM format, and a bit sink, the ADIP address, and AUX data. About the ADIP address to the ECC address obtained by detection of LPP data, the continuation value which carried out interpolation close [ of 0-3 ] to 2 bits of low order at order is given to the value which acted as the 2-bit left shift (it is multiplication at 4) of the LPP address value. Furthermore, as shown in drawing 2 (a), to the ECC block equivalent to the truck section which detected LPP data, the ADIP



address is transmitted as a PM signal in the truck section [ / before the next ECC block termination 32Tx16wobble from ECC block this side 32Tx16wobble ], since the four ADIP addresses are included in the section, gives the value carried out +four as opposed to the ADIP address, and transmits it as a PM signal. Moreover, 6 bytes per LPP data exist about AUX data, and after choosing 4-byte data required for a transfer from the inside (4 bytes of head is chosen in 6 bytes of AUX data as the example in drawing 8), it combines with the ADIP address, and it becomes irregular to PM signal and transmits to it. The determined bit data of the ADIP address and 4 bytes of AUX data are modulated by the pulse train as conversion and a PM signal in accordance with the format of PM format shown in drawing 2 (a). In addition, it not only adopts the address value carried out +four to the detected ECC address value, but generation of the explained ADIP address does not perform amendment by the value carried out -four or +4, and -4, and it does not care about it as a value as it is.

[0031] Next, it is carried out in the optical disk control circuit 8, and record control of the ECC block data from detection of the information modulated by transmitted PM signal to the recording track on an optical disk is explained. In drawing 8, it is carried out in the PM detector 22, and the detection result of the information included in transmitted PM signal is shown, and an ADIP address value and 1 byte of AUX data are detected after the bit sink of the ADIP WORD last, and detection of a data bit. The record control circuit 18 detects coincidence with the detected ADIP address value and the recording start ADIP address set up from a microcomputer 9, and when in agreement, it generates a record control signal to a modulation circuit 17. A record control signal controls modulation processing and generation initiation of a record signal as an example from 32 bytes of head of the ECC data 0 or subsequent ones, and controls them to end generation of a record signal at 32 bytes of the dummy ECC data head which ends record. A modulation circuit generates a record signal, performing modulation processing to the ECC data inputted according to a record control signal. A record pulse becomes irregular, and a record signal is formed as a record mark on the recording track on an optical disk 1, taking the synchronization with the data frame from the head of dummy data, and a wobble location.

[0032] Drawing 9 shows the transfer timing of PM signal for being carried out in the optical disk recording apparatus of drawing 7, and performing the roll control to an optical disk 1, and the generation method of PM signal. In drawing 9, detection of the LPP sink according the LPP sink to an even-frame location or an odd frame location to detection, measurement of a detection period, and protection is performed from a playback LPP signal in the synchronous detection protection network 10. The frame number counter contained in the frame timing generation circuit 14 shows the location of 26 1 sectors from detection of a LPP sink, and a frame counter shows the location in one frame (1488T). Each counter is synchronized by detection of a LPP sink, and the data bit detection after it.

[0033] Since the relation of the frame head in PM format, and a WORD sink and a bit sink head location is frame front 32Tx16wobble=512T as shown in drawing 2 (a), PM transfer timing is generated by decoding the maximum 1487-512 of a frame counter. Furthermore, about generation of PM signal, WORD sink generation generates 32Tx4wobble=128T piece by decoding of generation and a frame counter value by PM transfer timing at the time of a frame number counter value being 25. Bit sink generation also generates 32Tx2wobble width of face in the generation location to data 0 or data 1 with the data bit value (0 or 1) to which generation and data bit generation transmit similarly every two frames and 32Tx1wobble width of face by the same approach.

[0034] Therefore, fluctuation of an optical disk rotational frequency will be reflected in the transfer timing of PM signal by the frame counter with which PM transfer timing and PM signal generated follow the detection chronotropism of LPP.

[0035] In addition, a frame number counter and a frame counter are dividing counters, even when a LPP sink has not been detected, PM transfer timing is generated to the prediction timing which performed counter synchronization by the last detection, and a synchronization transfer of PM signal is performed.

[0036] Drawing 10 shows detection processing of the LPP data in the PM conversion circuit 24, generation processing of PM data, PM detection processing performed in the optical disk controller circuit 8, and generation of roll control timing. In drawing 10, generation of one LPP decoding per 1 ECC block and PM data is performed. Furthermore, ADIP decoding to transmitted PM signal is

performed 4 times per 1ECC block. Moreover, while performing ADIP decoding to PM signal transmitted in the optical disk controller circuit 8, roll control timing is generated. Signs that detection of a WORD sink and a bit sink synchronizes as an example of roll control timing in drawing 10 are shown. In the roll control circuit 20, an optical disk roll control is performed by the phase comparison of the pulse appearance period of roll control timing, and criteria timing with generation and the target number of revolutions in a control signal.

[0037] In addition, even if it has not detected the WORD sink and bit sink which are contained in PM signal, the roll control prevented and stabilized [ lack / interpolation and / pulse ] in the pulse is performed to the prediction timing generated from the last detection. In addition, about the WORD sink of roll control timing, and bit sink synchronization, synchronization of only a WORD sink and the approach of synchronizing once per bit sink train K (K being forward integer) individual are also considered.

[0038]

[Effect of the Invention] As explained above, according to this invention, it becomes possible to perform the record control and the optical disk roll control to the optical disk in PM format in the optical disk recording device corresponding to the optical disk in a LPP format. Furthermore, a configuration of the optical disk recording device corresponding to optical disk record of PM format and each LPP format is attained by establishing the selection means of the generated LPP signal and the LPP signal reproduced from the optical disk in a LPP format.

[0039] Moreover, it becomes possible to perform the record control and the optical disk roll control to the optical disk in a LPP format in the optical disk recording device corresponding to the optical disk in PM format. Furthermore, a configuration of the optical disk recording device corresponding to optical disk record of PM format and each LPP format is attained by establishing the selection means of generated PM signal and PM signal reproduced from the optical disk in PM format.

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[Translation done.]

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CLAIMS

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[Claim(s)]

[Claim 1] The data-transfer approach which is the data-transfer approach at the time of transmitting the data which detect the address information on the optical disk by which the phase modulation is carried out, and additional information to the playback wobble signal from the optical disk in a wobble phase-modulation format, and include the detection information, and is characterized by to transmit synchronizing to the current detection timing of the synchronizing signal by which the phase modulation is carried out in case the information generated based on said detection information is transmitted.

[Claim 2] As opposed to the playback wobble signal from the optical disk in a wobble phase-modulation format The address information on the optical disk by which the phase modulation is carried out, and additional information are detected. It is the data transfer approach at the time of transmitting data including the detection information. In case data transfer of the information which changes into the address information to the data block which is a record unit on an optical disk from a series of detected address information plurality, and includes the conversion result is carried out The data transfer approach characterized by transmitting while reproducing the wobble equivalent to the following data block.

[Claim 3] It is the optical disk recording device which performs record control per data block to the optical disk in a wobble phase-modulation format or a run DOPURI pit format. The 1st detection means which detects the address information on an optical disk, and addition data from the wobble phase-modulation section, A judgment means to judge the data block address from a series of address information plurality, A generation means to generate the data which applied to the run DOPURI pit format correspondingly to the transfer data containing a block address, and to generate the 1st transfer signal in the next data block period, The 2nd transfer signal obtained by the run DOPURI pit playback on an optical disk, The selection means, which carries out the selection output of the 1st transfer signal, and the 2nd detection means which detects the block address contained in the transfer signal after selection, The optical disk recording device characterized by providing the control means which pinpoints the target truck location and controls generation of a modulating signal, and an output from a detection block address.

[Claim 4] It is the optical disk recording device which performs record control per data block while performing an optical disk roll control to the optical disk in a wobble phase-modulation format or a run DOPURI pit format. The 1st detection means which detects the 1st synchronizing signal from the wobble phase-modulation section, and detects the address information on an optical disk, and addition data, While generating the data containing the 2nd synchronizing signal which applied to the run DOPURI pit format correspondingly to the transfer data containing address information A generation means to generate the 1st transfer signal synchronized to the 1st detected synchronizing signal, The 2nd transfer signal obtained by the run DOPURI pit playback on an optical disk, The optical disk recording device characterized by providing the selection means which carries out the selection output of the 1st transfer signal, the 2nd detection means which detects the 2nd synchronizing signal contained in the transfer signal after selection, and the control means which controls optical disk rotational speed from

the appearance period of the 2nd synchronizing signal.

[Claim 5] As opposed to the playback wobble signal from the optical disk in a wobble phase-modulation format The address information on the optical disk by which the phase modulation is carried out, and additional information are detected. It is the data transfer approach at the time of transmitting data including the detection information. A block address in case a series of  $2n$  ( $n$  is  $n \geq 1$  at forward integer) individuals of address information are assigned to one data block which is a record unit on an optical disk The data transfer approach characterized by being contained in a data block and giving the  $n$  bit right shift value of the detected address value.

[Claim 6] It is the data transfer approach [claim 7] characterized by giving  $+1$  or the value carried out  $-1$  to the  $n$  bit right shift value of the address value with which said block address was detected in the data transfer approach according to claim 5. The data-transfer approach which is the data-transfer approach at the time of transmitting the data which detect the address information on the optical disk modulated, and additional information to the playback run DOPURI pit signal from the optical disk in a run DOPURI pit format, and include the detection information, and is characterized by to transmit synchronizing to the current detection timing of the synchronizing signal modulated in case the information generated based on detection information transmits.

[Claim 8] As opposed to the playback run DOPURI pit signal from the optical disk in a run DOPURI pit format It is the data transfer approach at the time of transmitting the data which detect the address information on the optical disk modulated, and additional information, and include the detection information. The data block which is a record unit on an optical disk is changed into the  $2n$  2nd address information to the subblock divided into  $2n$  ( $n$  is  $n \geq 1$  at forward integer) individual from the 1st detected address information. The data transfer approach characterized by transmitting by the run DOPURI pit playback termination equivalent to the following data block in case data transfer of the  $2n$  information including the conversion result is carried out.

[Claim 9] It is the optical disk recording device which performs record control per data block to the optical disk in a wobble phase-modulation format or a run DOPURI pit format. The 1st detection means which detects the 1st address information on an optical disk, and addition data from a playback run DOPURI pit signal, The 1st generation means which generates the  $2n$  piece ( $n$  is  $n \geq 1$  at a forward integer) of 2nd address information from the 1st address information, The 2nd generation means which generates the data which applied to the wobble phase-modulation format correspondingly to each  $2n$  piece transfer data containing the 2nd address information, and generates the 1st transfer signal in the next data block period, The selection means which carries out the selection output of the 2nd transfer signal obtained by the wobble playback on an optical disk, and the 1st transfer signal, The optical disk recording device characterized by providing the 2nd detection means which detects the address information contained in the transfer signal after selection, and the control means which pinpoints the target truck location and controls generation of a modulating signal, and an output from the detected address information.

[Claim 10] It is the optical disk recording device which performs record control per data block while performing an optical disk roll control to the optical disk in a wobble phase-modulation format or a run DOPURI pit format. The 1st detection means which detects the 1st synchronizing signal from a playback run DOPURI pit signal, and detects the address information on an optical disk, and addition data, While generating the data containing the 2nd synchronizing signal which applied to the wobble phase-modulation format correspondingly to the transfer data containing address information The 1st generation means which generates the 1st transfer signal synchronized to the 1st detected synchronizing signal, The 2nd transfer signal obtained by the run DOPURI pit playback on an optical disk, The optical disk recording device characterized by providing the selection means which carries out the selection output of the 1st transfer signal, the 2nd detection means which detects the 2nd synchronizing signal contained in the transfer signal after selection, and the control means which controls optical disk rotational speed from the appearance period of said 2nd synchronizing signal.

[Claim 11] As opposed to the playback run DOPURI pit signal from the optical disk in a run DOPURI pit format It is the data transfer approach at the time of transmitting the data which detect the address

information on the optical disk modulated, and additional information, and include the detection information. When generating the 2nd block address of  $2n$  ( $n$  is  $n \geq 1$  at forward integer) individual from the 1st address information to one data block which is a record unit on said optical disk The data transfer approach characterized by being contained in a data block and giving the  $n$  bit left shift value of the 1st detected address information value.

[Claim 12] The 2nd block address generated in the data transfer approach according to claim 11 is the data transfer approach characterized by giving the value which the value followed from the address value over a data block head.

[Claim 13] The 2nd block address generated in the data transfer approach according to claim 11 is the data transfer approach characterized by giving  $+2n$  or the value carried out  $-2n$  to the  $n$  bit left shift value of the 1st detected address information value.

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[Translation done.]

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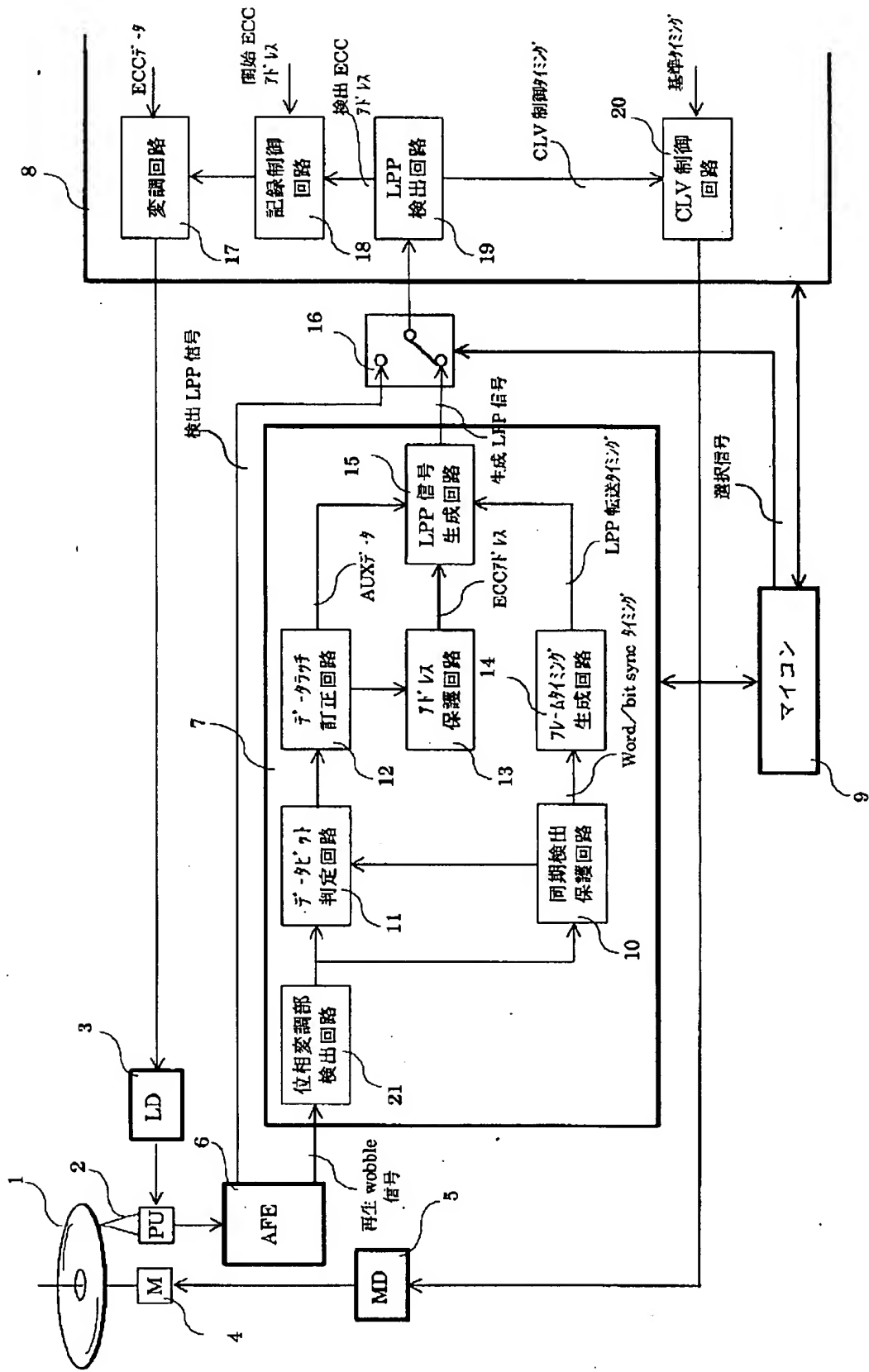
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DRAWINGS

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[Drawing 1]

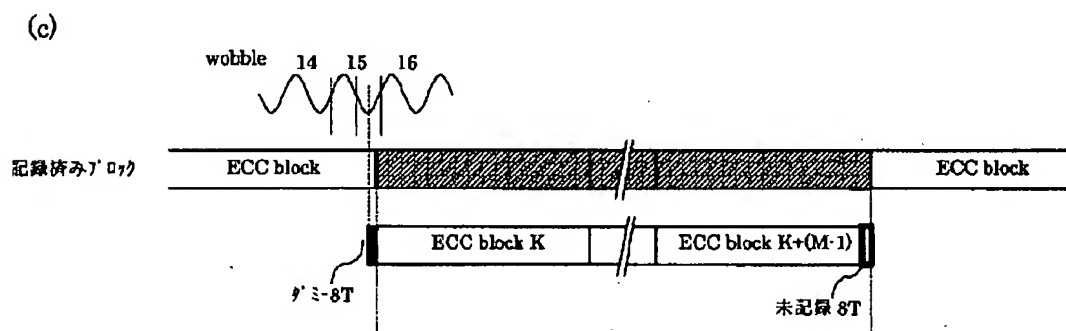
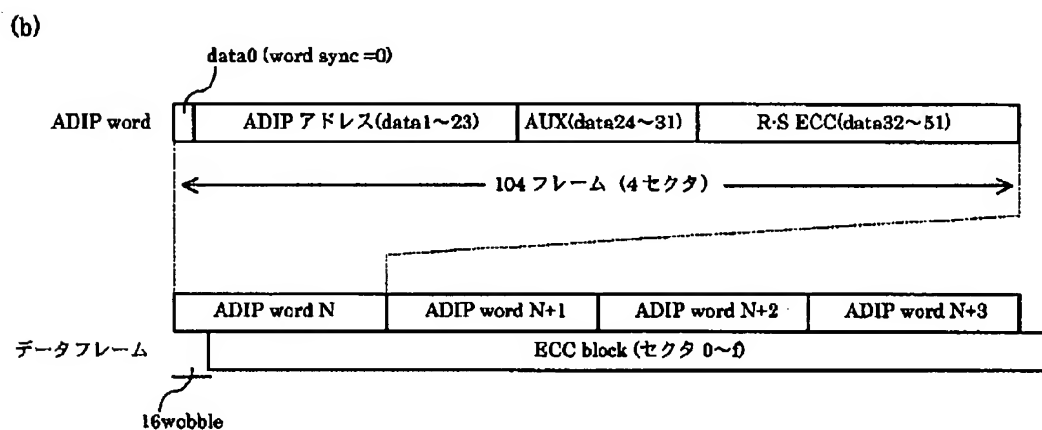
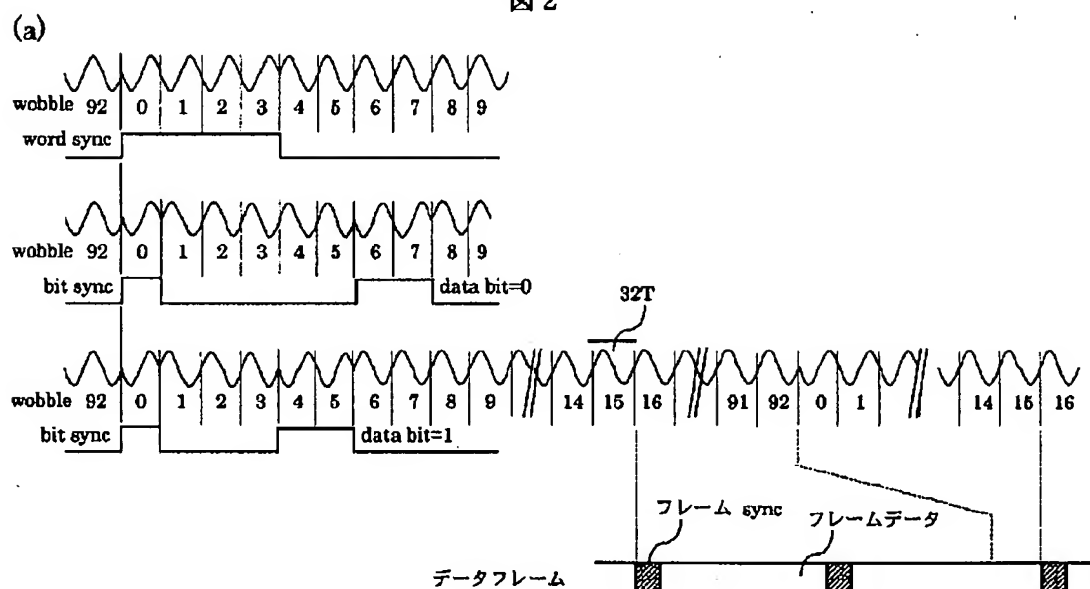
図 1



[Drawing 2]

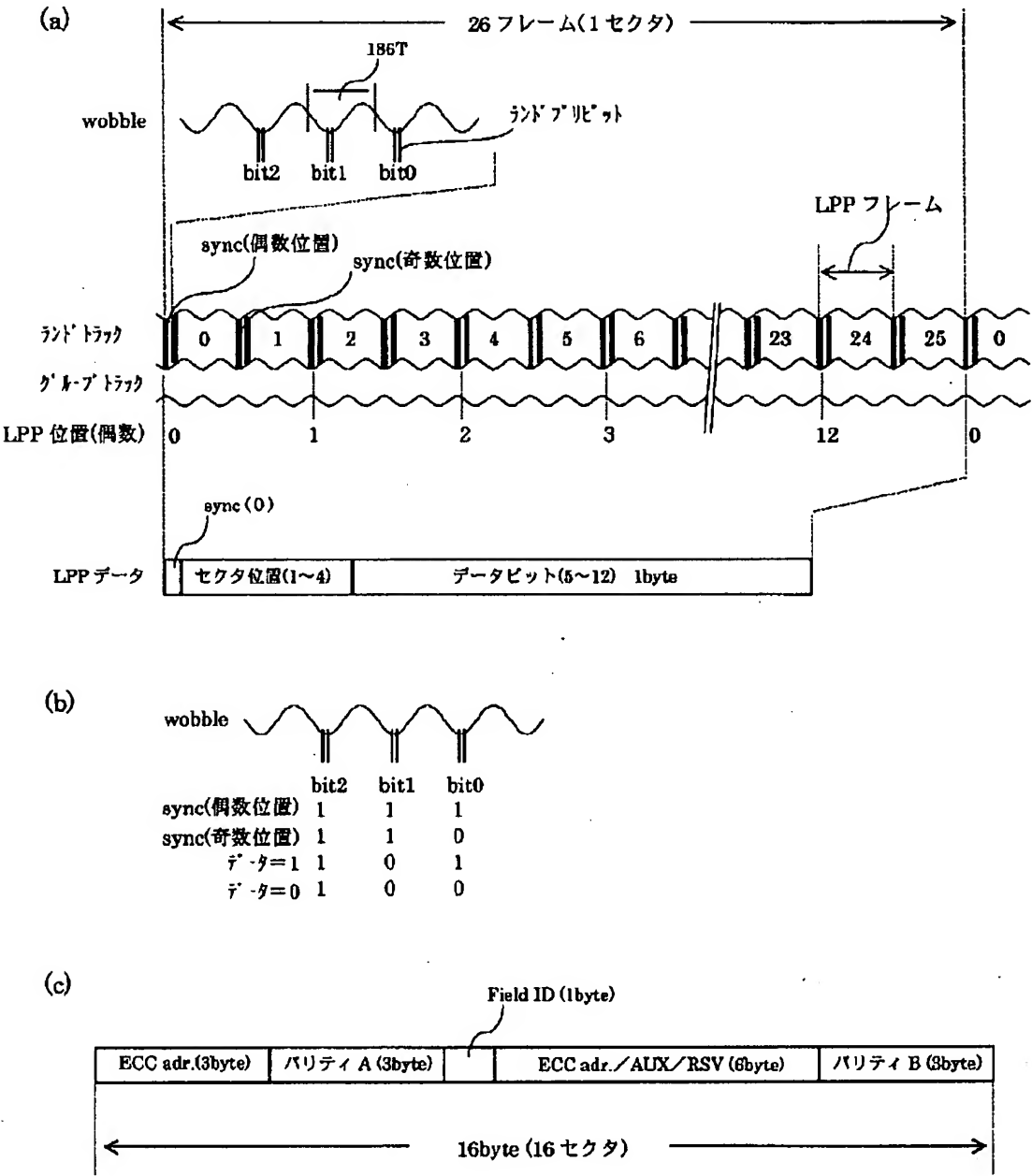


図 2



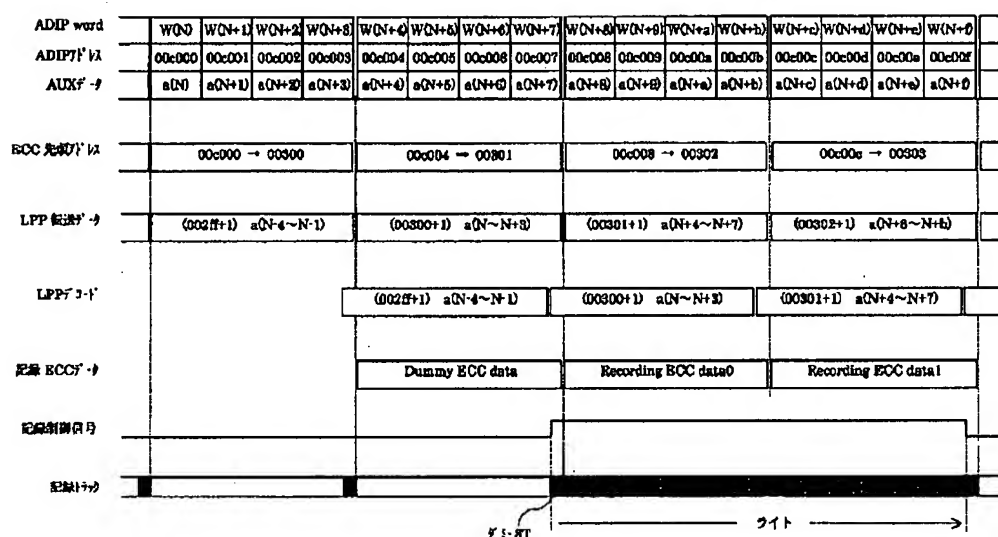
[Drawing 3]

図 3



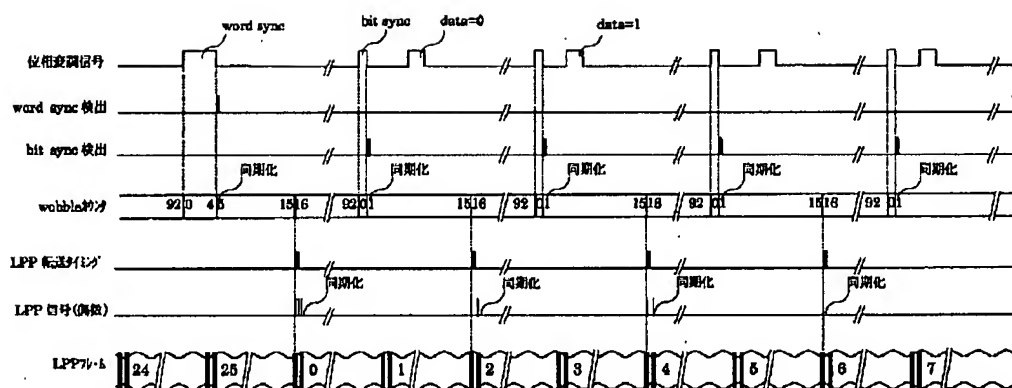
[Drawing 4]

図 4



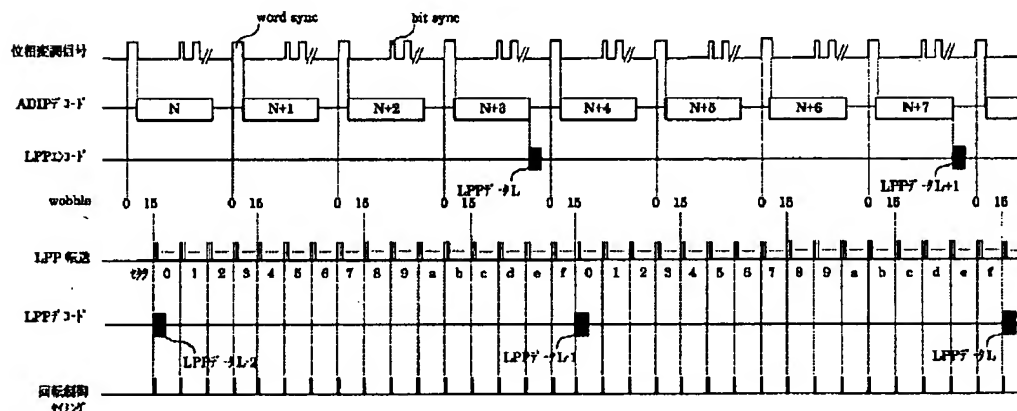
[Drawing 5]

図 5



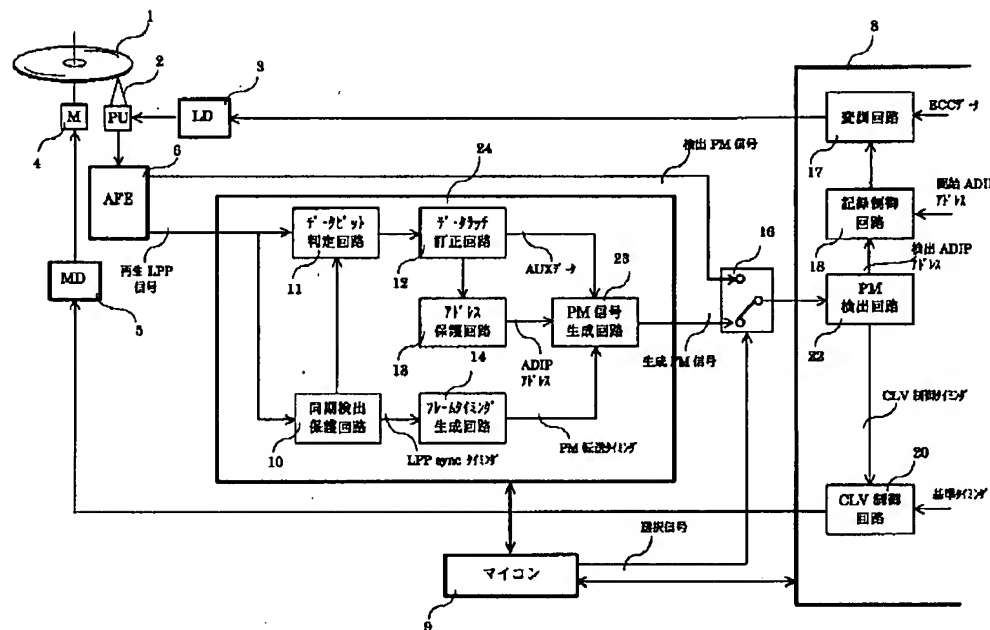
[Drawing 6]

図 6



[Drawing 7]

图 7



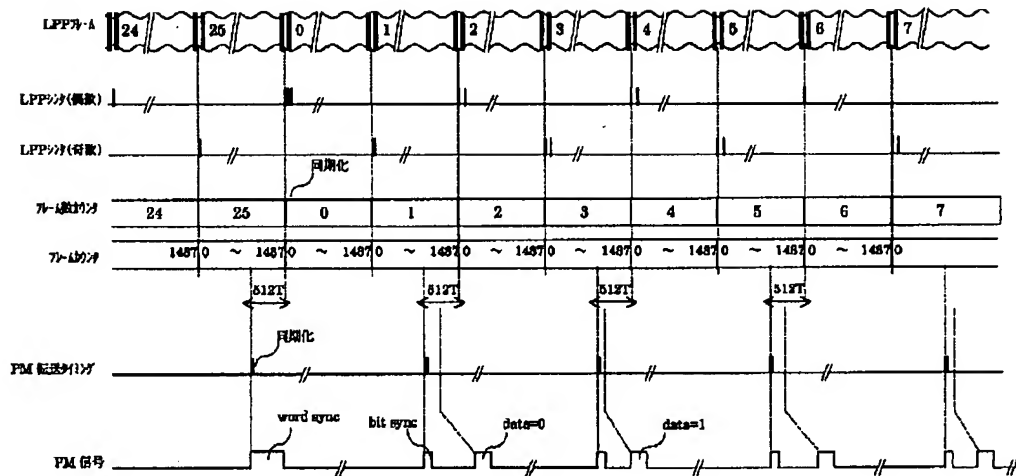
[Drawing\_8]

**EX 8**

LPE データ	D(N)				D(N+1)				D(N+2)				D(N+3)				
ECC7'1x	00300				00301				00302				00303				
AUXF 9.	a(N~N+3)				a(N+6~N+11)				a(N+12~N+17)				a(N+18~N+23)				
ADIFT'1x	00300 ↓ 00c000	00301 ↓ 00c001	00302 ↓ 00c002	00303 ↓ 00c003	00304 ↓ 00c004	00305 ↓ 00c005	00306 ↓ 00c006	00307 ↓ 00c007	00308 ↓ 00c008	00309 ↓ 00c009	0030a ↓ 00c00a	0030b ↓ 00c00b	0030c ↓ 00c00c	0030d ↓ 00c00d	0030e ↓ 00c00e	0030f ↓ 00c00f	
FM 転送F 9	00b0e +4 a(N+6)	00b0f +4 a(N+7)	00b10 +4 a(N+8)	00b11 +4 a(N+9)	00c000 +4 a(N)	00c001 +4 a(N+1)	00c002 +4 a(N+2)	00c003 +4 a(N+3)	00c004 +4 a(N+6)	00c005 +4 a(N+7)	00c006 +4 a(N+8)	00c007 +4 a(N+9)	00c008 +4 a(N+12)	00c009 +4 a(N+13)	00c00a +4 a(N+14)	00c00b +4 a(N+15)	
FM 3'1'	00c000 a(N+6)	00c001 a(N+7)	00c002 a(N+8)	00c003 a(N+9)	00c004 a(N)	00c005 a(N+1)	00c006 a(N+2)	00c007 a(N+3)	00c008 a(N+6)	00c009 a(N+7)	00c00a a(N+8)	00c00b a(N+9)	00c00c a(N+12)	00c00d a(N+13)	00c00e a(N+14)	00c00f a(N+15)	
AMR ECC 9					Recording ECC data0				Recording ECC data1				Dummy ECC data				
記録制御信号					<div style="border: 1px solid black; width: 100%; height: 40px; position: relative;"><div style="position: absolute; top: 5px; right: 5px;">F 3- 52byte</div></div>												
記録1'9																	
記録1'9					<div style="border-top: 1px solid black; border-bottom: 1px solid black; height: 10px; width: 100%;"></div> ライト												

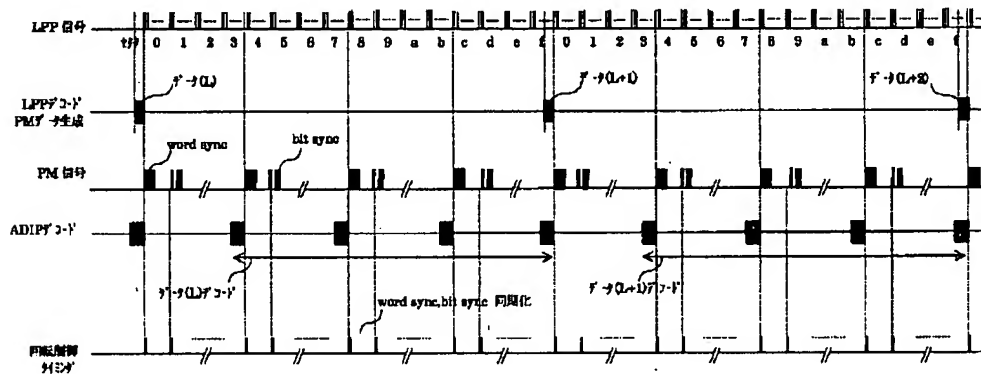
[Drawing 9]

图 9



[Drawing 10]

10



[Translation done.]